Lunar Periodicity in Sea Urchins

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The lunar periodicity in Paracentrotus lividus (Lam.) and Sphaerechinus granularis (Lam.) was studied at several stations in the North Adriatic during four years. No correlation was found between the moon cycle and the maturity of the investigated species.

Investigators using sea urchin gametes as experimental objects are familiar with the fact that even during the season when normally the animals should be ripe, sometimes nearly all gonads are "empty", i.e. without any ripe sperm or eggs.

Some authors described the influence of lunar cycle on the spawning of Diadema setosum at Suez and in the Java Sea. They have found that during its breeding season the gonads become empty at full moon, but Mortensen could not confirm this lunar periodicity. In Paracentrotus lividus at Woods Hole the lunar periodicity was not observed. An excellent review of lunar periodicity is given by Korringa.

Having these, sometimes controversial, results at our disposal, we tried to test the correlation between the moon phases and the maturity of Paracentrotus lividus Lam. and Sphaerechinus granularis Lam.

Material and Methods

In regular intervals during four years (1960—1963) the ratio of ripe and unripe specimens was determined and compared with the moon cycle. Owing to general lack of ripe animals in the winter the greatest number of observations refer to the spring, summer and autumn periods.

Sea urchins were collected by free diving technique or dredging. The number of specimens in each catch was large enough to ensure a representative result.

Normally the animals were opened by a circular cut and their sex and maturity were checked immediately after their removal from the bottom. Some results were obtained on animals opened in the laboratory as soon as possible after their removal from the sea.

The sites of sampling were chosen in the North Adriatic, near Rovinj, so that the unexpected local influences could be avoided.

Results and Discussion

The results of all measurements are shown together in Fig. 1, where the percentage of ripe specimens are plotted versus time.

Generally it may be concluded that sea urchins are ripe in the investigated area from March to September. Furthermore, it is evident that there is no lunar periodicity in the investigated species.

2 M. Yoshida, Annotes zool. jp. 25, 117 [1952].
5 P. Korringa, Eclog. Monogr. 17, 349 [1947].

Fig. 1. Variations of the percentage of sexually ripe Paracentrotus lividus (○) and Sphaerechinus granularis (×).
In June 1961 a sudden fall in the number of ripe *Paracentrotus* was observed which was not followed by a decrease of ripe *Sphaerechinus*, indicating that the stimulus for shedding acted specifically only on the *Paracentrotus*. Another sudden decrease of ripe animals observed in August 1962 was common to both species.

From the results obtained in the period June to August 1961 it seems that in *Paracentrotus lividus* it takes about two months to develop ripe genital products.

The knowledge of the physical and chemical parameters of the sea in the area where sea urchins were collected, does not offer any indication about the mechanism which governs the appearance and disappearance of sexually ripe specimens. Thus the average temperature of the surface layer of the sea is below 10 °C in March, when sea urchins are already ripe, while it is about 15 °C in November, when the gonads of nearly all specimens are without sperm and eggs. During the whole year the oxygen content is close to saturation or even above it. Variations in salinity are also not in correlation with the percentage of ripe animals.

The sudden decrease of ripe *Paracentrotus* in June 1961 and of both the investigated species in August 1962 can perhaps be to some extent attributed to the influence of spawning individuals on the ripe members of sea urchin populations. However, the reason for the long lasting lack of ripe animals during the second half of 1962 is without explanation.

Monroy reported that at Naples sea urchins usually shed after storm or the sirocco. Unfortunately we did not register the winds and we cannot analyze our results in this respect.

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7 A. Monroy, cited as personal communication in Harvey's *The American Arbacia*. 